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July 9. "History in the Elementary School." Miss Deratt.
July 10. "Geography in the Elementary School." Miss Baber.
July 13. "Science in the Elementary School." Mr. Jackman.
July 14. "Excursions." Miss Wygant.
July 15. "Painting, Drawing, Blackboard Illustrations." Miss Covington.
July 16. "Reading and Writing in Primary Grades." Miss Wygant.
July 17. "Manual Training." Miss Langley.
July 20. "Textile, Clay-Work, Metal-Work." Mr. Duncan.
July 21. "Kindergarten." Miss Allen.
July 22. "Relation of Kindergarten to First Grade. Miss Payne.
July 23. "Morning Exercises." Miss Hall.
July 24. "The Curriculum." Mrs. Thomsen, Miss Hall, Miss Wygant.

NATURAL SCIENCES.

COURSES IN THE TEACHING OF NATURE-STUDY.

PROFESSOR JACKMAN.

81 A. PRINCIPLES AND METHODS IN FIELD-STUDY.

The landscape as a source of subject-matter for nature-study. Based upon the outdoor materials afforded by the season. Students are expected to provide themselves with water colors and paper for landscape sketching. Other forms of expression.

NOTE.—It is recommended that students take an art course in painting and drawing in connection with this course.

Intended for students who enter for three weeks only. Given the first three weeks and repeated the second three weeks. Not for credit.

Outline of Course. Considerations as to Subject-Matter.

1. The landscape in its broader sense and as a whole; as an organism. Dominant centers of organization. Minor centers. As a moving picture: hourly, daily, seasonal, and cosmic changes. Evidences of change.

2. Interpretation of the landscape through color: the significance of color and color changes. Contrasts in the various seasons and their significance. Relations of color to light.

3. Surface characteristics: elevations, depressions, slopes, drainage.

4. Land and water relations: lakes, ponds, streams, marshes, moist and dry areas.

5. Plant life: its most striking divisions. Centers of organization. Timber and meadow lands. Water margins—valleys and shores. Marshes. Water areas. Dry areas. Border lines.

6. Animal life: its largest divisions. Centers of organization. Adaptations of structure. Relations to plants.

7. Distribution of heat and light on the landscape: daily, monthly, and seasonal. Surface and soil temperature. Use of the skiameter.

8. Distribution of moisture: rainfall; relative humidity; moisture in soils. Use of rain gauge and psychrometer.

9. Human life in the landscape: farms, gardens, sites for dwellings and factories; roads and streets. Development of industries and commerce. Political relations.

NOTE.— For an outline of the pedagogical questions to be considered, see after Course 82 A, below.

82 A. PRINCIPLES AND METHODS OF LABORATORY WORK ON A SELECTED AREA.

A study in experimentation as a means of solving special problems relating to particular landscape features and phenomena. Students are expected to provide themselves with water colors and paper for landscape sketching. It is recommended that an art course in painting be taken with this course. Summer quarter, first term; M.

Outline of Course. Considerations as to Subject-Matter.

1. Measurement and topographic survey of the area selected for study. Mapping and plotting.

2. Use of skiameter in the determination of light and heat intensity on the area—daily, seasonal. Plotting of results. Use of sunshine recorder.

3. Temperature of air, soil, and water. Plotting and comparison of results observed. Effects of slope, moisture, nature of soil, etc., on temperature.

4. Character of soil. Mechanical constituents. Capillarity. Capacity for water. Actual amount of water at different depths. Loss by evaporation. Organic matter.

5. Adaptation of animals and plants to different parts of the area. Roots, stems, leaves, flowers, fruits. Succession of plants during the season. Succession of plants in the history of the area. A study of the plant constituents. Calculation of amount of matter produced by growth in a season. Distribution and succession of animal forms. Use of illustrative museum material.

6. Rainfall on the area, seasonal and annual. Comparison with the annual average. Study of weather maps. Various forms of records for meteorological observation. Use of rain gauge and psychrometer. The use of the anemometer, barometer, and barograph.

7. Economic aspects of the area. Fitness for dwellings and factories; for gardens, for roads, etc. Relations of the cultivated plants to those growing wild.

PEDAGOGICAL CONSIDERATIONS RELATING TO THE PRESENTATION AND ADAPTATION OF SUBJECT-MATTER TO THE PUPILS OF VARIOUS GRADES.

(To be taken up in connection with both Courses 81 A and 82 A.)

1. Presentation of subject-matter: *genesis of the image.* The landscape as a basis for study of all science. Adaptation of its study to children. Relation of nature-study to science.

2. Expression: *definition of the image.* Color work as a means of expression; its fitness for children. Relation of painting and drawing to seeing. Clay-modeling in form-study. Function and form of written work.

3. Elementary mathematics: place of quantitative results in nature-study; adaptation of mathematical work (*a*) to the requirements of the subject; (*b*) to the capabilities of the pupils.

4. Reading as an aid in nature-study; its relation to observation.

5. Relations of nature-study to history and literature. Types of literature inspired by modern scientific ideas.

6. Place of nature-study in the curriculum: its relations to the social and industrial life of the pupils.

7. The moral bearings of nature-study. As a direct and indirect means in the development of character.

GEOGRAPHY.

ASSOCIATE PROFESSOR BABER.

DURING the first term of the summer quarter two courses in geography will be given. Course 106 is intended for teachers in the elementary schools. Course 107 is designed especially for teachers of geography in the elementary, secondary, and normal schools, and will be open to all who have a knowledge of physiography.

During the second term of the summer quarter (Course 108) the work in geography will be given in the field. This course will form a basis for the teaching of geography; it will consist of a study of the physiography, life, and industries of the regions visited. The field will be (*a*) northern Illinois, southern Wisconsin, and the Mississippi river from Prairie du Chien to Rock Island; or (*b*) the St. Lawrence river from Niagara Falls to the Saguenay river.

COURSE 106. THE STUDY AND TEACHING OF LOCAL AND CONTINENTAL GEOGRAPHY.

I. *Local geography.*—Experience is the basis of thinking; hence local geography must form a large part of geographic consideration. Within accessible distances from almost every school may be found the elements which make up the physical, life, and culture aspects of the world's landscapes. This region is especially rich in geographic types, both natural and cultural. Excursions will be made to Glencoe for the study of wave action, and also for the study of glacial drift; to the south shore, for a study of lake action on a low coast; to Dune Park, Ind., for sand dunes; to Cary, for a study of a terminal moraine; to Stony Island, for a study of glacial grooving and striae; to Fraction Run, where a stream has cut through limestone; up the Chicago river by boat, for a view of the industrial activities. Visits will also be made to some of the leading industrial centers of Chicago.

Landscapes: Elements which compose landscapes (form and color). Type-forms: Valleys, hills, mountains, plains, lakes, rivers, seas.

1. Valleys—formed by erosion. (Study ravines in clay at south shore and Glencoe; make valleys in out-of-door laboratory.) Process of lowering and widening of valleys. Formation of cañons, terraces, flood plains, deltas. Finding of permanent streams. Influence of rivers on harbors. Relation of Chicago river and Calumet river to Chicago.

REFERENCES: Davis, *Physical Geography;* Tarr, *Physical Geography;* Gilbert, "Henry Mountains," *U. S. Geographical Survey;* Gilbert and Brigham, *Physical Geography;* Salisbury and Alden, *Chicago and its Environs;* Russell, *Rivers of North America;* Geikie, *Earth Sculpture;* Dryer, *Physical Geography.*

2. Hills and depressions—formed by wind. (Study of sand dunes and swamps at Dune Park.) Genesis of dunes and swamps. Origin of sand. Location of the dune areas of the world. Movement of dunes. Method of making dunes stationary. Value of sand dunes.

REFERENCES: Davis, *Physical Geography;* Salisbury and Alden, *Chicago and its Environs;* Marsh, "Deserts," *Man and Nature;* Gaye, "Deserts," *Great World's Farm;* Johnston, "Deserts," *Compendium of Africa;* Van Dyke, *The Desert;* Sven Hedin, *Through Asia,* Vol. I.

3. Hills, valleys, and plains—due to glaciers. Contributions of glaciers to the local geography of Chicago. (Study of work of glaciers at Cary, Glencoe, and Stony Island.) Nature of material left by glacier; effect on bed-rock; location of existing glaciers. Extent of glaciation of North America, Eurasia. Meteorological conditions favorable to the formation of glaciers. Movement and work of glaciers. Was the North American continental glacier beneficial or detrimental to the areas affected? What would have been the probable result had the glacier reached the gulf of Mexico? What would be the probable condition here had the glacial period never occurred?

REFERENCES: Salisbury, *Journal of Geography,* Vols. I and IV; Salisbury and Alden, *Chicago and its Environs;* Davis, *Physical Geography;* Scott, *Introduction to Geography;* Chamberlin, "Terminal Moraine," *Third U. S. Geographical Survey;* Russell, *Glaciers of North America;* Giekie, *Earth Sculpture.*

4. Mountains and valleys—due to orogenic movement. (Illustrate mountain folding in laboratory.) Appearances of young and old mountains: rocks, vegetation, animal life, waterfalls, lakes, snow, glaciers. Effect of mountains on climate, and on distribution and concentration of peoples. Influence of mountains on rivers.

REFERENCES: Davis, *Physical Geography;* Reclus, *History of a Mountain;* Hutchinson, *Story of the Hills;* Gilbert, *Henry Mountains.*

Lakes: Lake Michigan. (Show wave-action in laboratory.) Wearing coast (Glencoe) — formation of sea cliffs, sea caves, terraces, distribution of eroded material. Building coast — sand bars, spits, beaches. Use: to commerce; water supply; fishing industry; sand industry. Lighthouses; life-saving station. (Visit Life-Saving Station at Jackson Park.)

REFERENCES: Shaler, *Beaches and Tide Marshes;* Davis, *Physical Geography;* Tarr, *Physical Geography;* Russell, *Lakes of North America.*

II. *Continental Study.*— North America as a type continent. Location and relation to other continents on the globe; size; shape; topography; climate; life; people.

1. Western highlands: position; extent; altitude; appearance; formation of Rocky mountains, Sierra Madre mountains, Cascade mountains, Sierra Nevada mountains, Coast Range; Great Basin; Mexican plateau; Central American mountains. Characteristics of the river basins found on western slope of great mountain mass — Colorado, Columbia, Frazier, Yukon, Sacramento, San Joaquin river basins. What advantages for human occupation do the western highlands possess? Influence of this great land mass on the rest of the continent. Influences, both good and evil, of desert, or semi-desert, region of the remainder of the continent.

2. Great central plain: extent; elevation; winter and summer appearance; glaciated area; account for lakes; non-glaciated region. Characteristics of the river basins — Mississippi, Mackenzie, Hudson Bay system. Value of the great plain in the development of the continent. Would a different arrangement of lowlands and highlands improve the continent as a home for man?

3. Eastern highlands: location; extent; appearance; Canadian highlands. Appalachian system — New England mountains; Blue Ridge; Alleghany plateau; Appalachian valley; Piedmont. Brief outline of geologic formation of the Appalachian system. Account for position of the Delaware, Susquehanna, Potomac, New, and Tennessee rivers. What is the effect of the Piedmont region on the rivers that cross it? What is the value of the Appalachian highlands to the present inhabitants of the United States? In what way did the mountains aid the colonists? What influence did they exert on the Civil War? Characteristics of St. Lawrence river basin.

4. Coastal plain: extent; appearance; formation. Account for shape of coast line; coastal islands; agricultural value of the coastal plain. What influence did the coastal plain exert on early settlement?

5. Central America and the West Indies: topography; formation; climate; products. Value of geographic position of the West Indies. Most important islands of the Greater Antilles; of the Lesser Antilles. Influence of volcanoes and coral reefs in the West Indies. Probable influence of the isthmian canal upon Central America and the West Indies.

6. Climate of North America: prevailing winds; movement of storm centers in the United States; distribution of heat. Southern limit of the

winter isotherm of 32°. Distribution of rainfall; snowfall. What would be the effect on the climate of North America if the eastern and western highlands had been reversed in position? What would be the effect on the climate of the plain if a high range of mountains crossed the northern country from east to west? What would be the effect upon this region if the Gulf of Mexico and the Caribbean Sea were land?

7. Vegetation: Distribution of grassy areas; of forests—conifer, deciduous, tropical. Products of each.

8. Industrial areas: agricultural; mining; stock-raising; lumbering; fishing; manufacturing. Are the present industries of North America the probable future industries of their respective areas?

9. Cities: Distribution of important seaports. Account for the location. Distribution of important inland cities. Distribution of political cities. Where will the great cities of the future be located? Why?

10. Political divisions. Geographic and political relation of the other political divisions of North America to the United States.

REFERENCES: North America, general description and western highlands: Mill, *International Geography; Compendium of North America;* Mill, *Realm of Nature;* Shaler, *Nature and Man in America; idem, Story of Our Continent.*

Central plain: Mill, *International Geography;* Reclus, *Earth and Its Inhabitants*, Vols. I, II; Dawson, *Canadian Colonies;* Russell, *Rivers of North America;* Russell, *Lakes of North America;* Stanford's *Compendium of Geography*, Vols. I, II; Shaler, *United States; Story of Our Continent;* Tarr and McMurray, *North America.*

Appalachian mountains: Davis, *Physical Geography of Southern New England*, "National Geographic Monographs;" Willis, *Appalachian Mountains, Northern Section*, "National Geographic Monographs;" Hayes, *Appalachiau Mountains, Southern Section*, "National Geographic Monographs;" *Compendium of North America.*

Central America: *Bulletin of Republics of America*, "Nicaragua," "Costa Rica," "San Salvador;" Brigham, *Guatemala, The Land of the Quetzal;* Bates, *Central America;* Vincent, *In and Out of Central America.*

West Indies: Hill, *Cuba, Jamaica, and Porto Rico, with Other Islands of the West Indies;* Hill, "Geology of Cuba," *Bulletin*, Vol. XVI, No. 15, Museum of Comparative Zoölogy, Cambridge; Hill, "Geology of Jamaica," *ibid.*, Vol. XXXIX; Hearn, *Two Years in the West Indies;* Paton, *Down the Islands;* "Cuba," *National Geographic Magazine*, May, 1898; "Martinique," *ibid.*, July, 1902; "Martinique," *Century*, September, 1902.

Climate: Davis, *Physical Geography; Elementary Meteorology;* Waldo, *Elementary Meteorology;* Archibald, *The Story of the Atmosphere; Compendium of North America.*

Industries: Shaler, *United States;* Marsh, *The Earth as Modified by Human Action;* Paton, *Natural Resources of the United States;* Mill, *International Geography;* McFarlene, *Commercial Geography;* Adams, *Commercial Geography;* Keltie, *Applied Geography;* Mill, *Elementary Commercial Geography.*

COURSE 107. THE AIM OF GEOGRAPHIC TEACHING IN THE ELEMENTARY AND SECONDARY SCHOOLS.

1. Kind of imagery: (*a*) dynamic, (*b*) static. What geographic images are necessary to an appreciation of history? Age at which the desire for casual relations is strong.

2. Æsthetic training. Is the æsthetic appreciation of landscape enhanced by scientific knowledge? In what aspect of the landscape are children first interested? Can a love of landscape be cultivated? Influence of the æsthetic aspect of the landscape on the distribution of people.

REFERENCES: Shaler, "Landscape as a Means of Culture," *Atlantic Monthly*, December, 1898; Shaler, *Interpretation of Nature;* Geikie, *Scenery of Scotland;* Lubbock, *Scenery of Switzerland;* Hamerton, *Landscape.*

3. Moral influence of the right study of geography.

4. Essential knowledge.

a) Experiential information.

(1) Field-work. Guide for the selection of areas for field trips. Manner of conducting excursions. Difficulties met with. Results of field-work. Excursions to industrial centers, farm, quarry, manufactories. Value of industrial excursions. Opportunities for training students on excursions not afforded in the schoolroom.[1]

(2) Laboratory.[2] Experiments to illustrate the development of land forms; with running water—formation of valleys, cañons, islands, deltas, falls, hills, mountains; by wave action—sea cliffs, sea caves, sand bars and sand spits, harbors, bays, gulfs, peninsulas; by air currents—formation of sand dunes; by lateral pressure—formation of mountains by folding, volcanoes; by evaporation and condensation—rainfall, frost, snow. Measurement of the altitude of the sun. The amplitude of sunrise and sunset. How construct a geographic laboratory out of doors; indoors.

(3) Museums. Collection and use of museum material. Circulating museum.

b) Knowledge obtained by indirect means. Geographic literature for elementary and secondary schools. Books for teachers. Geographic magazines for teachers and students.

c) Maps. Value of map-making. Use of reliefs, physical, contour, political, hachure, and relief maps. Physical wall maps: Kiepert's series, Habericht-Sydow series, Rand-McNally; Atlases: Andree, Steeler, Berghous, McMillan, Longman's *New School Atlas;* political maps: Johnson, Bacon, Rand-McNally; relief: Howells, Davis, models; globes. Which should precede—map-making or map-reading? What is the value of map-drawing to the pupil? In what grades can contour maps be used? In what grades should contour maps be made? How can a map be presented so as to serve its function as a symbol? What maps are most useful in elementary and secondary schools? Best selection of contour maps of the United States for use in the elementary and secondary schools. *United States Topographic Folios.*

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[1] Excursions will be made to typical geographic areas and industrial centers.

[2] The term "laboratory" is here used when referring to experiments which are performed in order to discover some natural law.

d) Pictures. Photographs colored and uncolored; paintings; drawings; slides. Selection of type pictures of earth forms; industries; homes; people. Places for obtaining pictures.

5. Expression. Sand-modeling, chalk-modeling, painting and drawing. Relation of expression to observation, to memory. Value of landscape drawing in black and white; in colors. Creative work in geographic drawing. Skill in graphic expression necessiated for teaching geography.

6. The basis for the selection of a curriculum for the elementary and secondary schools: Culture; utility. At what age should the study of geography begin? When end? Why? When are children naturally interested in industrial geography; in political geography; in physical geography; in biogeography; in ethnogeography? What phases of geography, if any, should continue through the elementary and the secondary schools? How much of the world's geography should be covered in the teaching of physiography in the high school? What relation should be maintained between history and geography in the elementary and secondary schools? What influence should the world's current events have upon the selection of subjects of study? What influence should local changes — meteorologic, physiographic, and cultural — have upon the daily program? How can geography be made a study of principles rather than a study of facts? Laws which govern topographic forms; climate; distribution of vegetation and animals; distribution of cities; products; commerce. When should a child be made conscious of the principles underlying geographic facts?

MATHEMATICS.

PROFESSOR MYERS.

WHATEVER may be said concerning the pedagogy in general of the recent past, the most obvious, if not the most flagrant, fault of recent mathematical pedagogy is its fragmentary character. It fails signally to recognize the important pedagogical discovery of a few years since, that the whole boy comes to school. Time forbids entering here upon the philosophy of the origin of this patent fault, though reasons for its prevalence among us would not be far to seek. But in this age of pedagogical stir phenomena are being thrown to the surface of the educational waters too rapidly to be accounted for; we are able only to take account of them, and to explain what we mean when we think we see one. For the present, therefore, we shall be content with a few words of explanation of what we mean by the statement that the most telling weakness of recent mathematical pedagogy is its fragmentariness.

With the general enrichment and consequent disturbance of the elementary and secondary curricula through the introduction of the modern subjects, mathematics has for a long time been playing at "Pussy wants a corner." She is still passing nervously from neighbor to neighbor in the general scram-